

Sustainable food production and consumption SYLLABUS

Study subject No: 2.2.

Responsible Unit: Latvia University of Life Sciences and Technologies (LBTU)

Credits and distribution of academic hours*:

	Credits ECTS	Contact hours		Independent study hours	Total hours
		Lectures	Practical works or seminars		
LBTU	7	20	43	147	210
Total	7	20	43	147	210

* 1 ECTS = 30 hours (9 contact hours and 21 independent hours);

1 academic hour = 40 minutes;

Theoretical lectures not less than 50% of contact hours.

Course developers:

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Notes: General study course for the master programme Bioeconomy.

Prior knowledge: none.

Annotation: Food production, specifying differences between organic and conventional food (from raw materials to ready products). The characterisation of organic agriculture as management form, perspectives of development and situation. The legislation regarding to organic food products, its characterisation. The comparison of organic and conventional agricultural systems, main differences between them. The processing conditions, operations and possibilities of animal and crop origin raw material in organic and conventional food production.

The characteristic of allowed processing technologies, food additives, technological aids, their functions in organic and conventional food production. Packaging materials and packaging technologies for organic and conventional food products. The labelling of food products, trademarks of organic agriculture in Europe. Safety and wholesomeness aspects of organic and conventional food products.

Sustainable use of resources supporting soil quality and health; supporting water protection practices in food production; bio-security practices in food production; evaluation of bio-security practices in food production; framing the quality standards for food and feed to ensure safety. Enhancing yield, out-put, by-product recycling and sustainable use of valuable compounds in food and non-food industries. Novel technological solutions in the food chain. Supporting producers to implement best practices of sustainable food production. Emphasizing sustainable food consumption.

The aim: of present study course is to increase food proficiency through understanding the economic and environmental impact of food production using several technologies including emerging technologies and consumption choices; to develop critical thinking through analysis and evaluation of sustainable food practices.

Description of the organization and tasks of students' independent work:

The student prepares and defends the independent work in accordance with the requirements, which must be submitted in writing before the defence to the lecturer of the study course. The maximum volume of the summary of the results of the individual work will be 20 A4 format pages. The summary should include the following points:

1. Introduction.
2. Comparison of chosen organic and conventional food product quality (chemical composition, microbiological parameters, safety aspects) taking into account legislation in force, which detect organic food production.
3. Comparison of technological operation during production chosen food product in organic and conventional food systems.
4. Comparison of packaging material, label and price of chosen food product in conventional and organic food systems, possibilities to decrease price of the chosen product.
5. Possibilities to extend the shelf life of the selected food product using emerging technologies.
6. Conclusions and proposals.
7. List of used literature.

Learning outcomes (knowledge, skills and competences)

Learning outcomes	Assessment methods	Levels of achievement		
		Satisfactory	Average	High
KNOWLEDGE				
Student gets knowledge about food production (using traditional and novel technologies) and quality of food products from organic and conventional agriculture to prevent its microbiological spoilage and to prolong shelf life.	Discussion in classes	Knowledge of the most important steps of food processing for shelf-life ensuring for food products	Understanding of the most important steps of organic food processing for shelf-life ensuring for food products	Understanding of the differences between organic and conventional food processing for ensuring shelf-life for food products
Student gets knowledge about by-product processing and application in different industries (food, cosmetics, pharmaceutical etc.).	Case studies, laboratory works, test	Knowledge of the basic principles of by-products processing	Knowledge and understanding of the basic principles of by-products processing	Comprehensive knowledge and understanding of the basic principles of by-products processing for new products obtaining
SKILLS				
Professional skills				
Student is able to analyse and to find out differences in raw materials quality from organic and conventional farming. Student is able to find important differences among production aids and food additives allowed in organic and conventional farming and understand its importance for food safety and quality.	Discussions in classes, independent work, laboratory works	Knowledge of the main differences of organic and conventional food product production process. Student does not explain some of his decisions	Knowledge and understanding of the main differences of organic and conventional product production process. Student can explain his decisions.	Comprehensive knowledge and understanding of the main differences of organic and conventional food product production process. Student has ability to critically assess taken decisions.

Student is able to choose appropriate processing technology with aim to increase out-put, to decrease pollution and by-products amount, water and energy use.				
Soft skills				
<i>Student is able to analyse and evaluate differences in processing methods and conditions of animal breeding and crop product from organic and conventional agriculture.</i>	Discussions in classes, independent work	Student has ability to solve only practical issues for processing of organic food (for one product) products.	Student has ability to explain advantages and disadvantages of processing technologies of organic food products, the made decisions may be questionable.	Student has ability to explain advantages and disadvantages of processing technologies of organic food products, decisions made are based on analysis and regularities.
COMPETENCE				
Student is able to justify their choice, comparing organic and conventional food product production, by analysing significant differences in food production technologies, by assessing yields, by-products processing, and possibilities to apply novel technologies, products nutritional value, and safety aspects.	Discussions in classes, laboratory work, independent work	The knowledge is based only on the quality of organic food product, other components influencing the quality and costs of the organic food products have not been evaluated	The knowledge is based on the analysis of many components that affect the quality and costs of the organic food products	The knowledge shall be based on an analysis of all the components affecting the quality and costs of the organic food products

Requirements for awarding credit points:

At the end of the course, obtained students' knowledge is evaluated using a 10-point scale according to the following criteria: the amount and the quality of the obtained knowledge, acquired skills and competence in compliance with the planned learning outcomes. Participation in seminars and laboratory works is mandatory.

The final rating of the study course will be resulted from the:

1. Results of intermediate written test E1 (legalisation of organic agriculture) 20% and discussion of their results.
2. Results of intermediate written test E2 (about differences of organic product production and quality) 20% and discussion of their results.
3. Results of intermediate written test E3 (about novel technologies in food industry) 30%.
4. Presentation: chosen product characterisation (30%).

Knowledge assessment and prerequisites for taking a test or examination. The final mark in the course is based on written tests (3) and presentation.

** 10 percent are equal to one point on a 10-point marking scale (or 10 percent are equal to 0.5 point on a 5-point marking scale).*

Topic	Type of assessment	Percentage	Assessment deadline
Legalisation of organic agriculture	Test	20%	Within the specified time for the test
Differences of organic product production and quality	Test	20%	Within the specified time for the test
Novel technologies in food industry	Test	30%	Within the specified time for the test
Characterisation of chosen product	Presentation	30%	Within the specified time for the presentation
Total		100	-

The course contents

1. Lectures

1. The characterisation of organic agriculture as management form, perspectives of development and situation in the World, Europe and Central Asia. The legislation regarding to organic agriculture and organic food products, its characterisation. The comparison of organic and conventional agricultural systems, main differences between two systems.
2. The processing condition and possibilities of animal origin raw material as meat, milk and eggs in organic agriculture.
3. The technological operations and regimes for production of animal origin raw materials. The characteristic of allowed food additives, technological aids, they function in organic animal origin food products in organic agriculture. The characteristic of organic crop-cultivation products processing condition and regimes.
4. Packaging materials and packaging technologies for organic food products. The labelling of food products, trademarks of organic agriculture in Europe and Central Asia.
5. Safety and wholesomeness aspects of organic food products.
6. Microbiological spoilage of food.
7. Food irradiation. Purpose of irradiation. How Is Food Irradiated? Radiation doses. Ionizing effect. Gamma rays, X rays, E-beams (Electron beams) application in food industry. Membrane technology. Micro filtration. Dia-filtration. Ultra-filtration. Capillary filtration. Nano-filtration. Reverse osmoses. Filters constructions and working principles.
8. Processes for food surface treatment: pulsed electric field technology, ultraviolet light technology, infrared light technology.
9. Minimal food processing. Washing of minimally processed fruits and vegetables with chemical-based treatments. Parameters to monitor for assuring the optimum disinfection procedure in fresh-cut washing. Electrolyzed water, mechanism of action. Organic acids.

2. Practicals

1. The characterisation of organic agriculture as management form, perspectives of development and situation in the World, Europe and Central Asia.
2. The legislation regarding to organic agriculture and organic food products, its characterisation.
3. The comparison of organic and conventional agricultural systems, main differences between two systems.
4. The processing condition and possibilities of animal origin raw material as meat, milk and eggs in organic agriculture.
5. Main differences of quality of organic and conventional animal origin products.

6. The technological operations and regimes for production of animal origin raw materials. The characteristic of allowed food additives, technological aids, they function in organic animal origin food products in organic agriculture.
7. The characteristic of organic crop-cultivation products processing condition and regimes.
8. Packaging materials and packaging technologies for organic food products. The labelling of food products, trademarks of organic agriculture.
9. Safety and wholesomeness aspects of organic food products.
10. Microbiological spoilage of food.
11. Food irradiation. Application possibilities for several food products, advantages and disadvantages.
12. Membrane technology. Application possibilities for several food products, advantages and disadvantages.
13. Processes for food surface treatment. Application possibilities for several food products, advantages and disadvantages.
14. Minimal food processing. Several methods application possibilities, advantages and disadvantages. Food shelf-life determination.

List of sources of training, methodological and scientific literature and information

Compulsory reading (books, scientific articles, online sources etc.):

1. Bavec F, Bavec M (2006) Organic production and use of alternative crops, CRC Press, 241 pp.
2. Commission Regulation (EK) Nr. 1881/2006 (2006. 19. December), setting maximum levels for certain contaminants in foodstuffs.
3. Commission Regulation (EK) Nr. 271/2010 (2010. 24. March), laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007, as regards the organic production logo of the European Union
4. Miguel Garcia J., Teixeira P. (2016) Organic versus conventional food: A comparison regarding food safety. Food Reviews International, Volume 33, 2017 - Issue 4, 424-446 p.
5. Organic cereals and pulses. (2002) /ed. by Younie, D. Taylor, B.R. Weelsh, J.P. Wilkinson J.M.– UK: Chalcombe.178 p.
6. Quality of Organic vs. Conventional Food and Effects on Health (2011) / ed. By Matt D., Rembalkowska E., Luik A...Peetsmann E, Pehme S.. Estonian University of Life Sciences, 104 p.
7. Organic Agriculture: <http://www.fao.org/organicag/oa-faq/oa-faq1/en/>
8. Emerging Technologies for Food Processing. Ed. by Da-Wen Sun. Elsevier, 2005, 771 p.
9. Fellows P.J. Food Processing Technology: Principles and practice. Woodhead Publishing, CRC Press, 2009. – 913 p.

Further reading:

1. Blackburn, C. (2008) Food spoilage microorganisms. Cambridge, England, CRC Press. 784 p.
2. Steele R. (2004) Understanding and measuring the shelf-life of food. Cambridge, England, CRC Press. 480 p.
3. Food Science and Technology (2017) Ed. by G. Campbell-Platt. Hoboken, NJ: Wiley-Blackwell, 564
4. Toledo R. T., Singh R. K., Kong F. (2018) Fundamentals of Food Process Engineering. Cham: Springer International Publishing. 449 p.

Periodicals and other sources:

1. Organic-Europe <http://www.organic-europe.net/home-europe.html>
2. The World of Organic Agriculture 2019 - <http://www.organic-world.net/yearbook/yearbook-2016.html>

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